THE CONCEPT OF VALUE CHAINS IN AGRICULTURE, CLIMATE ACTION AND ENVIRONMENTAL RESOURCES

GLOBAL ISSUES & LOCAL PERSPECTIVES

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Preface

This book adopts an exegetical approach as well as a pedagogic model, making it attractive agriculture and environmental economics teachers, professional practitioners and scholars. It is eschews pedantry and lays bars the issues in such clarity that conduces to learning. The book elaborates on contemporaneous ***The Concept of Value Chains in Agriculture, Climate Action and Environmental Resources*** issues of global significance and at the same time, is mindful of local or national perspectives making it appealing both to international and national interests. The book explores the ways in which climate change, food security, national security and environmental resources issues are and should be presented to increase the public's stock of knowledge, increase awareness about burning issues and empower the scholars and public to engage in the participatory dialogue climate change, food security, national security and environmental resources necessary in policy making process that will stimulate increase in food production and environmental sustainability.

The Concept of Value Chains in Agriculture, Climate Action and Environmental Resources: Global issues and Local Perspectives is organized in three parts. Part One deals with The Concept of Value Chains in Agriculture, Part Two is concerned with The Concept of Climate Actions and Part Three deals with the Concept of Value Chains and Environmental Resources.

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Chapter Seven

The Effects of Poultry Manure and NPK 15:15:15 Inorganic Fertilizer on the Growth of Maize (Zea *mays L.*) in Ibadan Oyo State

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Introduction

Maize (Zea mays L.) is the most important cereal worldwide (Adebayo *et al*., 2017; Bashir *et al*., 2018). Increasing human population and urbanization has led to intensive cultivation without adequately replenishing soil nutrients which has led to the decline in crop yields and depletion of the resource base. In an attempt to boost crop production, farmers use both inorganic and organic fertilizer to increase the condition of crop growth. The extent to which organic fertilizer could increase the efficiency of applied mineral fertilizers in sustaining soil and crop productivity has not received much research attention. The little data available, however, indicate that integrated plant nutrition involving the combined use of organic and mineral fertilizers increase crop yields more than either used alone (Quansah,2000). Maize (*Zea mays L.*), also well known as corn, is an important staple cereal crop worldwide belonging to the Poaceae family. It is a nutrient-demanding crop, and therefore adequate and balanced nutrient supply is important in its growth and production (Salim, *et al.* 2020). The Portuguese brought maize (*Zea mays L.*), a cereal monoecious shrub native to South and Central America, to West Africa in the tenth century (Iwena, 2012). According to Onwueme and Sinha (2009), it is among the top three cereal crops farmed globally by both commercial and peasant farmers. After rice and wheat, it is rated third globally in terms of both production and consumption (Yayock *et al*., 2006; Romains, 2011). Globally, 66% of maize produced is fed to cattle, 25% is consumed by humans, and 9% is utilized for industrial and seed

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purposes (Romains, 2011). At the moment, maize is becoming a more significant source of biofuel in the form of ethanol, which is fermented and distilled from processed kernels and mixed with gasoline derived from petroleum, and corn oil, which is utilized as bio-diesel. In different ratios for fuel use (Romains, 2011: IITA, 2007). Because of its great value to humans, animals, and industries, maize needs to be improved in terms of both quality and quantity. The low rice production can be attributed to several causes, the most significant of which are inadequate soil fertility and improper crop nutrient management. Fertilizer is essential for restoring nutrients removed from the soil during crop harvest and for adding additional nutrients to increase production (Olatunji and Ayuba, 2012). Numerous studies have demonstrated that adding organic materials to soil, such as chicken droppings, cow dung, and farm yard manure, can boost crop yields, especially for West African subsistence farmers (Asadu and Unagwu, 2012). Nonetheless, because organic and inorganic fertilizers complement one another, using both will ensure that the issues related to using either type of fertilizer are significantly reduced. According to Ojeniyi (2000), almost all attempts have been unsuccessful.

Inorganic and organic fertilizers are both beneficial on plants growth but the use of organic fertilizers is more suitable and eco-friendly. It has been observed that organic and inorganic fertilizers have demonstrated good efficacy against the growth of maize plants (Zea mays).

Organic fertilizer are made of decomposed material originating from living organisms which creates compost and can be combined with different manures. The decomposition process occurs through the action microorganisms in the soil which make nutrients in this material available for absorption by plants. (Bashir *et al* 2022).

Numerous studies have demonstrated that under Nigeria's intense continuous agriculture, the combination application of organic and inorganic fertilizers is necessary for sustainable soil productivity (Adepetu, 1997). Therefore, this research work was carried out with objectives as to study effect of poultry manure and inorganic fertilizers on growth in order to identify the best combination of the fertilizers.

Materials and Method

The Aquatech College of Agriculture and Technology Teaching and Research Farm in Ibadan, Oyo State, Southwest Nigeria, was the site of this investigation. The region is located in Southwest Nigeria forest-savanna transition zone, between Latitude 7^0 82^1 N and Longitude 3^0 55^1 S. The following supplies were used: NPK 15:15:15, corn seed, hoe, cutlass, notepad, pen, vernier caliper, tape rule, Lara force, and poultry excrement. Three replicates were used in a fully randomized design (CRD) for the experiment. There was a 5m by 9m plot. The control group received no fertilizer, organic fertilizer ($4tha^{-1}$), NPK 15:15:15 ($300\ kgha^{-1}$), and a mixture of chicken droppings. We spread the organic fertilizer one week before to planting. Using a hoe, it was gently worked into the soil after being evenly distributed over the plots. Two weeks after planting (WAP), inorganic fertilizer (NPK 15:15:15) was administered by ringing around the maize plant (Liu *et al*, 1996). Throughout the trial, the plots were manually weeded. Fresh corn was collected at 12WAP. Growth parameters for maize, including plant height, stem girth, number of leaves, and leaf area, were measured during the growing stage. A measuring tape was used to determine the plant's height and leaf area. From the soil's surface to the plant's apex, the height of the plant was measured. To calculate the leaf area, the leaf's length and width were measured. A vernier caliper was used to measure the plant's girth. A one-way analysis of variance (ANOVA) test was performed on all the obtained data at the 5% significant level where Duncan Post Hoc analysis was used to conduct the follow-up test. At $P<0.05$, statistical significance was established.

Results and Discussion

The appendices of this study showed the variance results (ANOVA) tables. The following headings are used to present the results: Before planting, the soil's physical and chemical characteristics, as well as the organic matter's chemical composition, were examined. Additionally, the effects of poultry dropping and NPK 15:15:15 fertilizer on the height of the maize plant at 4, 6, 8, and 10 weeks after planting, the stem girth of the plant at 4, 6, 8, and 10 weeks after planting, and the number of leaves at 4, 6, 8, and 10 weeks after planting were also examined.

Table1: shows the physical and chemical properties of the soil before planting and the chemical composition of organic matter. The textural class of the soil is sandy loam with pH 5.95.

Properties	Samples Values
pH	5.95
Sand	87.40%
Silt	6.60%
Clay	9.60%

Physical properties values of soil

Properties	sample values
Ca	8.91cmol
Mg	3.37cmol
K	0.50cmol
Na	0.80cmol
Al+H	0.05cmol
ECEC	13.63cmol
Base Salt	99.63%
N	0.16%
Org.C	1.84%
Av. P	19.4mg/kg
Mn	124.95mg/kg
Fe	10.05mg/kg

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Zn	37.90mg/k

Chemical properties values of soil

Table 2: Comparative values effect of poultry droppings and NPK 15:15:15 fertilizer on the plant height of maize growth at 4, 6, 8 and 10weeks after planting.

Treatment	week4 (cm)	week6 (cm)	week8 (cm)	week10 (cm)
Poultry manure (T_1)	47.21^b	67.42^b	89.32b	102.33^a
Poultry manure +NPK (T_2)	51.97^b	76.96^b	98.89^b	121.35^b
NPK (T_3)	49.67^b	72.53^b	96.10^b	117.54^b
Control (T_4)	40.31^a	60.07^a	72.66^a	91.80^a

Means with different alphabets are significantly different at $p<0.05$

The table2 above shows the weekly fertilizer application effect on maize plant height: plant height was significantly different in the treatment groups from week 4 to week 10 with treatment (4) serves as a control having the least plant height while treatment 2 serves as organic and inorganic combined has the highest plant height from week 4 to week 10.

Table 3: Comparative effect of poultry droppings and NPK 15:15:15 fertilizer on the stem girth of maize growth at 4, 6, 8 and 10 weeks after planting.

Treatment	week4 (cm)	week6 (cm)	week8 (cm)	week10 (cm)
Poultry manure (T_1)	2.58^b	3.20^b	3.60^b	4.03^a
Poultry manure +NPK (T_2)	3.17^b	3.72^c	4.17^c	4.29^b

NPK (T_3)	3.03^b	3.62^c	4.07^c	4.18^b
Control (T_4)	2.48^a	2.60^a	3.18^a	3.80^a

Means with different alphabets are significantly different at $p<0.05$

The table3 above shows the weekly fertilizer application effect on maize stem girth: Stem girth was significantly different in the treatment groups from week 4 to week 10 with treatment 4 serves as a control having the least stem girth while treatment 2 serves as organic and inorganic combined has the highest plant height stem girth from week 4 to week 10.

Table 4: Comparative values effect of poultry droppings and NPK 15:15:15 fertilizer on the number of leaves of maize growth at 4, 6, 8 and 10 weeks after planting.

Treatment	week4(cm)	week6(cm)	week8(cm)	week10(cm)
Poultry manure (T_1	10.33^b	11.67^b	14.17^b	15.50^a
Poultry manure+NPK(T_2)	9.83^b	10.17^b	13.00^b	14.67^b
NPK(T_3)	9.33^b	10.17^b	12.17^b	13.50^b
Control(T_4)	8.17^a	8.33^a	9.83^a	11.33^a

Means with different alphabets are significantly different at $p<0.05$

The table4 above shows the weekly fertilizer application effect on maize number of leaves. Number of leaves was significantly different in the treatment groups from week 4 to week 10 with treatment 4 serves as a control having the least number of leaves while treatment1 had the highest number of leaves from week 4 to week 10.

Table 5: Comparative values effect of poultry droppings and NPK 15:15:15 fertilizer on the leaf area of maize growth at 4, 6, 8 and 10 weeks after planting.

Treatment	week4(cm)	week6(cm)	week8(cm)	week10(cm)
Poultry manure (T_1)	305.9^b	695.84^b	1047.43^b	1226.53^b
Poultry manure+NPK(T_2)	518.74^c	867.19^c	1124.55^b	1378.15^b

NPK(T_3)	348.98[b]	768.71[c]	1029.20[b]	1334.02[b]
Control(T_4)	197.17a	393.60[a]	719.23[a]	966.87[a]

Means with different alphabets are significantly different at $p<0.05$

The table5 above shows the weekly fertilizer application effect on maize leaf area. Leaf area was significantly different in the treatment groups from week4 to week 10 with treatment 4 serves as a control having the lowest leaf area while treatment 2 had the highest leaf area from week 4 to week 10.

DISSCUSSION

Based on the results obtained various agriculture practices are needed to increase the maize grain yield and yield components, and the nutritional quality of maize grains as the soil of arable land areas has very low organic content and nutrient deficient. (Amen and Al-Homaidan 2022). Negative soil and other methods of managing natural resources can have negative effects on humans and the environment. Future farmers will need to overcome the challenges of increasing food production on already farmed land in addition to having to keep farming the same grounds. Therefore, to maintain soil productivity under intense continuous agriculture, a combination of inorganic and organic fertilizers is required. Applying NPK and poultry manure combined enhanced the growth and yield of the maize crop, according to this study's findings. Combining NPK with chicken manure will enhance the properties of the soil, reduce the high dose of fertilizer required per unit area, and perhaps be a prudent management strategy for the sustainable production of tropical maize. (Zafar *et al 2023*).

CONCLUSION

In conclusions the result of this study suggested as follows:

Applying both organic and inorganic fertilizer together enhances maize crop development and yield: -

- It is thus advised that smallholder farmers use both organic and inorganic fertilizer simultaneously.
- The experiment's outcome demonstrated that the optimum growth and yield parameter was

obtained by combining NPK fertilizer with poultry manure. Therefore, it is highly advised that Nigeria implement soil amendment for sustainable maize production.

• To ensure that the findings have a wider or more widespread acceptance, it is also advised that comparable study be done in numerous other local government or agricultural settlement.

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